

# **CHAPTER J1**

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## **J1.00 Introduction**

The Other Structures Program HM3J includes maintenance and repair of tunnels, tubes, ferries, and pumping plants. Tunnel or tube maintenance includes washing, cleaning, tile repair and the maintenance of electro-mechanical equipment. Tunnel structural repairs will be performed under this program when covered by approved Office of Structure Maintenance and Investigations reports of work needed. Ferryboat maintenance includes all work to maintain ferryboats and related facilities such as slips, fenders, and docks. Pumping plant maintenance includes structural repairs, removal of material from the sumps, and periodic servicing and/or repairs of all electrical and mechanical equipment.

See Chapter “H” for definitions and illustrations of tunnels, tubes, and pumping plants, and for the responsibilities of Area Bridge Maintenance Engineers and District Maintenance Engineers.

Refer to Maintenance Manual Volume 2 for administrative details covering the HM3J Program.

## **J1.01 Maintenance Levels**

The general objective is to maintain all facilities to their initial construction, or to subsequent improvement in order to ensure structural integrity, preserve the capital investment, aesthetics, and provide motorists a safe and comfortable passage.

Deficiencies that immediately affect safety and/or structural integrity should be given first priority.

Second priority should be given to correction of deficiencies not having an immediate effect on safety, structural integrity, or capital investment.

**J1.01.1      Tunnel, Tube, Ferry, and Pumping Plant Inspections**

Frequent visual surveillance should be made to detect deficiencies or conditions which may impair the structural integrity of tunnels, tubes, ferries, and pumping plants, or result in a hazard to traffic, pedestrians and adjacent property.

In addition to the physical inspection, an engineering investigation and evaluation of all tunnels, tubes, and ferries should be made by Structure Maintenance & Investigations (SM&I) a minimum of once every two (2) years. The Division of Engineering Services Office of Electrical, Mechanical, Water and Wastewater (OEMW&W) should make an engineering investigation and evaluation of pumping plant mechanical and electrical equipment at least once a year.

Investigations and evaluations should be comprehensive and include all portions of the facility. A written report should be made of all engineering evaluations on tunnels, tubes, ferries, and pumping plants.

First priority defects should be repaired promptly or temporary repairs made until permanent repairs can be scheduled.

Correction of second priority deficiencies should be coordinated with routine maintenance operations but initiation or scheduling of corrective action should not be delayed more than 30 days.

**J1.01.2      Tube and Tunnel Cleaning**

Tiled or painted tunnels or tubes should be cleaned a minimum of twice a year. Localized conditions such as high truck volumes may necessitate more frequent cleaning.

**J1.02      Tunnels and Tubes**

This section deals principally with tunnels and tubes incorporating mechanical ventilating systems that are staffed by full-time Tunnel Operators. It shall be the responsibility of the Superintendent to ensure that all Maintenance personnel are familiar with pertinent sections of Title 8 of the California Administrative Code covering orders issued by the Department of Industrial Relations (Cal/OSHA).

(A) Fire Alarm System

Where the tunnel fire alarm system is connected into the fire alarm system of another agency, no work shall be done upon the tunnel fire alarm system without notifying the other agency.

(B) Carbon Monoxide Analyzer Systems

The carbon monoxide analyzers shall be maintained and calibrated in accordance with instructions issued by the manufacturers of the analyzers.

(C) Electrical and Lighting Systems

Tunnel Maintenance Workers shall be familiar with the operation of all switches, breakers and other safety or operating equipment.

Repair or adjustment of electrical equipment shall be done by qualified electricians only. Permanent changes in the circuitry of the tunnels (tubes) shall not be made without consulting SM&I. This is not intended to prevent electricians from making necessary emergency connections.

(D) Fans, Motors, and Drives

Lubrication of bearings and machinery shall conform to requirements of Section J1.02.5, Lubrication.

Belt drives shall be adjusted in accordance with the recommendations of the belt manufacturers. When V-belt drives are replaced, they shall be replaced with matched sets of V-belts only.

(E) Lubrication

Standard items of manufacture such as electric motors, engines, compressors, gear reducers and pillow blocks incorporating sealed ball or roller bearings are usually furnished with Maintenance manuals that include recommended lubrication practices.

These practices shall be followed exactly unless overruled by "Specific Lubrication Instructions."

The manufacturer's manuals and the Specific Lubrication Instructions shall be made a part of the "Special or Supplemental Orders" included in data posted in each control room.

### **J1.03    Ferryboats**

Ferryboats shall be maintained in a serviceable condition and shall be the joint responsibility of District Maintenance, Office of Structure Maintenance and Investigations, and the Equipment Service Center. Every effort shall be made to keep ferries operational. Shutdowns for routine servicing and maintenance shall be scheduled during shifts of minimum vehicular use of the ferries.

The United States Coast Guard (USCG) does not currently inspect ferryboats, because no fee is charged to the public at the time of boarding. SM&I, in cooperation with the Equipment Service Center, will conduct biennial investigations and prepare engineering reports. Every effort shall be made by the district to provide service contracts to dry-dock the ferry on a 5 year cycle. This dry-dock service will allow for a complete hull inspection and repairs as required.

#### **(A)    Lubrication.**

Standard items of manufacture such as electric motors, engines, compressors, gear reducers and pillow blocks incorporating sealed ball or roller bearings are usually furnished with maintenance manuals that include recommended lubrication practices.

These manuals shall be made a part of the maintenance manual in the control room, and the recommended lubrication practices shall be followed exactly unless overruled by "Specific Lubrication Instructions."

Lubrication of open gears, wire ropes and sleeve bearings must be varied to meet the conditions under which they operate. Open gears seldom used and subject to accumulation of sand or dirt will be better protected and get less wear by painting with State Specifications 8010-61J-45 paint and leaving all oil or grease off the teeth.

Due to the great variation in proper lubrication requirements of somewhat similar facilities the proper practice for each ferryboat will be covered in Specific Lubrication Instructions.

The manufacturer's manuals and the Specific Lubrication Instructions for each ferryboat shall be made a part of the Special or Supplemental Orders included in data posted in each control room.

#### **(B)    Fire Protection.**

Fire extinguishing equipment shall be installed and maintained in accordance with requirements of the United States Coast Guard (USCG).

(C) Lifesaving Equipment.

Lifesaving equipment shall be installed and maintained in accordance with requirements of the USCG.

**J1.04    Pumping Plants**

Pumping plants shall be maintained in a clean and serviceable condition, and shall be inspected and the pumps manually operated at intervals frequent enough to ensure that the pumping equipment is in proper operating condition.

The building shall be kept swept out and generally cleaned up. Miscellaneous supplies and tools, other than those needed frequently for the pumping plant, shall not be stored in the pump building.

During the rainy season, the pumping plants should be inspected and test operated at least once every two (2) weeks. During the off season, the pumping plants shall be inspected and test operated at least monthly.

The test operation consists of operating each pump for approximately 5 seconds by switching the pump selector switch to the "HAND" or "MANUAL" position. Care shall be taken to ensure that the selector switches are reset to the "AUTO" position after each test so that the pump operation will be controlled by the water level in the storage box or pump sump.

During the rainy season, the sump screens shall be inspected regularly and kept free of all debris that will impede free flow of water to the pumps.

When large amounts of dirt or debris are entering the storage box or pump sump, due to erosion of cut slopes or to improperly screened catch basins, measures should be taken to stabilize the cut slopes and/or intercept the dirt or debris before it reaches the collection system.

Prior to each rainy season, each pumping plant shall be given a complete inspection, by an OMEW&W representative, and the supervisor who is charged with its maintenance.

Pump out fall facilities should be inspected and cleaned, if necessary to ensure a free flow of water beyond the pumping system.

During this annual inspection, the main power or control disconnect shall be opened and the electrodes removed from the stilling tube and cleaned if necessary. A brush and strong detergent solution is recommended for cleaning the electrodes. The connection of the suspender wires to the electrodes shall also be checked at this time for any corrosion at the connection, or of the suspender wire itself.

If the plant is equipped with a source of emergency power, it should be exercised at least bi-monthly. The most satisfactory method of testing the emergency power plant is to simulate water in the sump by grounding the electrodes and then simulating a power failure by opening the main power switch. After a successful start and test run of the emergency power plant and its associated controls, close the main power switch. If the plant goes through its normal shutdown procedure, return the plant to normal utility power.

These operational tests shall be made only by qualified personnel, either an electrician or pump maintenance personnel.

Dikes and other facilities installed to prevent the encroachment of off site drainage into the depressed area shall also be inspected and repaired if necessary.

#### J1.04.1        Lubrication

Pumping plants can be broken down into two (2) basic types: wet pit and dry pit. Each requires a different type of lubrication. In the wet pit, the pumps are submerged directly in the wet sump and are fitted with grease lubricated sleeve bearings. In the dry pit, the pumps are mounted in a dry sump with their suction lines connected to the wet sump through a dividing wall. These pumps are fitted with anti-friction type ball or roller bearings.

##### (A) Wet Pit Style Pumps.

The column bearings are oil lubricated from a solenoid operated oil lubricator. The reservoirs shall be filled at all times with a non-detergent SAE 20 or SAE 30 weight oil.

The lubricators should release oil to each column bearing at the rate of 8-12 drops per minute.

During the rainy season, the pump bearings shall be greased approximately every 2 weeks or 2 hours of running time, whichever occurs first. During the off season, the pumps shall be greased bi-monthly (unless the pump is subjected to ground water or landscape watering run off, in which case it shall be greased on the same basis as for the rainy season).

**(B) Dry Pit Style Pumps.**

The dry pit pump is fitted with anti friction ball or roller bearings with grease retaining seals.

Because these bearings retain their grease supply and are not submerged in water, they do not require as frequent greasing as the wet pit pump bearings. Greasing of ball or roller bearings shall be limited to making up for the small amount of grease that may leak by the seals. If an abnormal amount of grease is observed leaking past the grease seals, the grease seal should be replaced.

If a dry pit is accidentally flooded, the pumps shall be shut down and the Area Bridge Maintenance Engineer or the OEMW&W representative assigned to the district notified immediately.

**(C) Motors.**

The electric motors are fitted with ball or roller bearings, some oil lubricated and others grease lubricated. It is very important that these bearings be lubricated in exact accordance with the maintenance instructions furnished with the motor.

**J1.04.2 Electrical Equipment**

Repair or adjustment of the electrical equipment shall be done by qualified electricians only.

Other Maintenance personnel charged with maintenance of pumping plants shall be made familiar with the switches and reset buttons that operate the plant but shall not be permitted to attempt repairs of the electrical equipment.

Permanent changes in the circuitry of the pumping plants shall not be made without consulting the Office of Structure Maintenance. This is not intended to prevent electricians from making necessary emergency connections.

The electrodes and float switches are set at certain elevations at the time of construction. No changes shall be made in these elevations without consulting the Office of Structure Maintenance.



**J1.04.3          Data to be Posted**

The following information shall be posted in each drainage-pumping plant. This means attaching to one wall in the pumping plant at a noticeable location, or placing in a clearly labeled binder or file:

- (A) Pump house Electrical Schematic.
- (B) Superintendent's name, address and telephone number.
- (C) Name and telephone number of Area Bridge Maintenance Engineer assigned to the district.

In addition to the above, a Pumping Plant Log (See page J-11) shall be mounted on a clipboard and hung on the wall where it will be very noticeable to anyone entering or leaving the pump house. Each time a Maintenance Worker enters a pumping plant, he or she shall record the visit in the log along with any work done during the visit. Most pumping plants have running time meters which record the accumulative running time of the pumps. It is very important that these times be recorded on every visit whether any work is done or not.

**J1.04.4          Safety Procedures**

Work in drainage pumping plants shall be done in accordance with all of the following:

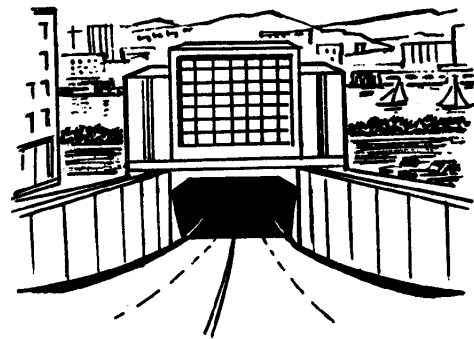
- (A) Article 108, General Industry Safety Orders, Title 8 California Administrative Code.
- (B) Caltrans Safety Manual, Chapter 2, Section 2-25: Confined Spaces.
- (C) All other instructions posted at the pumping plant.

**TUNNELS, TUBES, FERRIES, AND PUMPING PLANTS**



**TUNNEL**

**TUNNEL**—This term is used in the name of a passageway which carries State Highway traffic underground such as through a hill or mountain.



**TUBE**

**TUBE**—This term is used in the name of a passageway which carries State Highway traffic below or under a body of water.

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